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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/864,208	05/25/2001	Norio Kimura	2001_0660A	1632

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EXAMINER

LUND, JEFFRIE ROBERT

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 05/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/864,208

Applicant(s)

KIMURA ET AL.

Examiner

Jeffrie R. Lund

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 February 2005.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 14-16, 18, 20, 22, 23, 25, 27, 29 and 38-40 is/are pending in the application.
4a) Of the above claim(s) 14 and 15 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 16, 18, 20, 22, 23, 25, 27, 29 and 38-40 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 08 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 16, 18, 20, 22, 23, 25, 27, 29, and 38-40 are rejected under 35 U.S.C.

112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 16, 23, 38 and 39 all contain the limitations of "measuring the film thickness of the first metal layer with an eddy current monitor" and "said eddy current monitor monitoring a combined impedance of said first and second metal layers with a sensor circuit". The specification does not explain how the eddy current monitor can measure the film thickness of the first metal layer while monitoring the combined impedance of the first and second layer. The eddy current monitor works by measuring the eddy current, which is proportional to the thickness of the layer. It is not possible for the eddy current monitor to measure the combined impedance of the first and second metal layers and calculate the thickness of the first metal layer. The specification teaches:

In the film thickness measuring device 10-14 of eddy current type, eddy current is generated in conductive films (copper plating film layer 106 and feed seed layer 107) of the semiconductor substrate W by applying high frequency electrical

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current to a sensor coil, and, since the eddy current is changed in accordance with the film thickness, by monitoring combined impedance with a sensor circuit, the film thickness is measured. (Page 27 lines 7-14)

This clearly teaches that the film thickness is the sum of the copper plating film layer 106 and the copper feed seed layer 107. This is also taught in the specification on page 15, lines 8-26 and page 16, lines 17-25. In fact on page 16, lines 17-25 teach that the eddy measuring device is used to measure the copper film 106 to a measurement of 500 nm and less than 500 nm an optical device is used to measure the thickness of the layer until the barrier layer is exposed. Thus the total thickness is measured not the just the first metal layer.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 16, 18, 20, 22, 23, 25, 27, 29, and 38-40 are rejected under 35

U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 16, 23, 38 and 39 are indefinite in that they are not clear how the eddy current monitor monitoring a combined impedance of said first and second metal layers can measure the film thickness of the first metal layer and determine the polishing end point.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 16, 23, and 38-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laursen et al, US Patent 6,555,466, in view of Lehman et al, US Patent 6,621,264 B1.

Laursen et al teaches a method of chemical mechanical planarization (polishing) of a first metal layer 2 and a second metal layer 4 that includes the steps of: polishing the first metal layer by pressing and moving the first metal layer against a polishing surface with a first polishing fluid; detecting the end point; rinsing (cleaning) the polishing surface using water; polishing the second metal layer by pressing and moving the second metal layer against the polishing surface with a second polishing fluid; and measuring the second metal layer until it reaches a second end point. (Entire document, specifically, column 3 line 65 through column 4 line 17)

Laursen et al differs from the present invention in that Laursen et al does not teach that an eddy current monitor detects the stop point of the first polishing step and an optical film thickness monitor measures the thickness of the second metal layer during the second polishing step.

Lehman et al teaches that an eddy current monitor works well with thick films (i.e. the first film) and the optical film thickness monitor works better with thin films (column 13 lines 7-43), and that the thickness measurement can be stored for future reference.

The motivation for measuring the first end point with an eddy current monitor and

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the second end point with an optical film thickness monitor is to use the most accurate measurement system as taught by Lehman et al in measuring the end points as required by Laursen et al but only generically described.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to measure the end points of Laursen et al with the eddy current monitor and optical film thickness monitor of Lehman et al.

7. Claims 18, 20, 25, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laursen et al and Lehman et al as applied to claims 16 and 23 above, and further in view of Hara et al, 6,451,696 B1.

Laursen et al and Lehman et al differ from the present invention in that they do not teach that the second metal layer of the substrate is pressed against the polishing surface by a load which is smaller than the load when polishing the first metal layer, the first and second polishing liquids have a PH at the same side of PH 7.

Hara et al teaches a polishing method that includes a first etching step having a load of 200 gf/cm² and a PH of 10.5, and a second etching step having a load of 100 gf/cm² and a PH of 10.5. (Column 12 lines 14-37)

The motivation for reducing the load and maintaining the PH of the slurry on the same side of PH 7 is to optimize the speed and quality of the polishing process as taught by Hara et al.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the load and maintain the PH of the slurry in the method of Laursen et al and Lehman et al as taught by Hara et al.

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8. Claims 18, 20, 25, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laursen et al and Lehman et al as applied to claims 16 and 23 above, and further in view of Allen et al, 6,292,708 B1.

Laursen et al and Lehman et al differ from the present invention in that they do not teach cleaning and drying the substrate after the second polishing step is complete.

Allen et al teaches cleaning and drying a substrate after the substrate is polished. The motivation for reducing the load and maintaining the PH of the slurry on the same side of PH 7 is to optimize the speed and quality of the polishing process as taught by Allen et al.

The motivation for cleaning and drying the substrates is to clean and dry the substrates after they have been polished as taught by Allen et al.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to clean and dry the substrates of Laursen et al and Lehman et al as taught by Allen et al.

Response to Arguments

9. Applicant's arguments filed February 17, 2005 have been fully considered but they are not persuasive. The eddy current monitor of Lehman et al will inherently measure the combined impedance of the first and second layers to provide the total thickness of the conductive film. It is not possible for the eddy current monitor to measure the current in the first metal layer and second metal layer independently.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

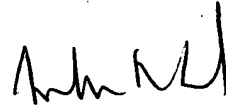
11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrie R. Lund whose telephone number is (571) 272-1437. The examiner can normally be reached on Monday-Thursday (6:30 am-6:00pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Jeffrie R. Lund'.

Jeffrie R. Lund
Primary Examiner
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JRL
5/10/05